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ON TRIONYX FOVEATUS, LEIDY, AND TRIONYX VAGANS, COPE, FROM THE CRETACEOUS ROCKS OF ALBERTA

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ON TRIONYX FOVEATUS, LEIDY, AND TRIONYX VAGANS, COPE, FROM THE CRETACEOUS ROCKS OF ALBERTA.

By Lawrence M. Lambe

(With four plates.)

During the past summer whilst engaged, on behalf of the Geological Survey, in making a collection of vertebrate remains from the Cretaceous of the Red Deer river, Alberta, to supplement the material obtained in two former years, the writer was fortunate enough to secure two almost complete carapaces of turtles, one referable to *Trionyx foveatus*, Leidy, the other to *T. vagans*, Cope. In the Red Deer river district, referred to, the remains of these two species are abundant and are found associated with a number of other species of Chelonia, of which one is *Adocus variolosus*,* Cope (sp.), remarkable alike for its size and the strikingly rugose character of the sculpture of its shell. The rocks holding these remains belong to the Belly river series of the Cretaceous brackish water deposits underlying the Pierre Fox-Hills formation, by which they are separated from the still higher Laramie series.

Trionyx foveatus† was originally described in 1860 by Leidy from small fragments of costal and sternal bones from the Judith river beds of Nebraska.

*Proceedings of the Academy of Natural Sciences of Philadelphia, vol. XXVIII, p. 257, 1876 (Cope), and Ottawa Naturalist, vol. XV, p. 63, plates iii, iv, v and vi (Lambe).

†Transactions of the American Philosophical Society, vol. XI, p. 148, pl. xi, figs. 1 and 2. Extinct Vertebrata from the Judith river and Great Lignite formations of Nebraska.

The Red Deer river specimen of *T. foveatus* consists of the carapace, in which the nuchal plate is missing, without any part of the plastron. Sternal plates, probably referable to this species, were found not far distant, but further reference will not be made to them here.

The carapace (Plate II, fig. 2) is a little less than one fourth broader than long, and is only slightly convex. The eight costals of the left side are practically entire, but the first right costal is wanting. Five neural plates are preserved with part of another that lay principally between the first costals, its posterior end being between the front inner borders of the second costals. If this neural were as long in proportion to its breadth as the plate immediately following it, its front margin probably effected a sutural union with the nuchal plate, and its outline was presumably as is shown by the dotted lines in the figure.* Neurals two, three and four are six-sided, neural five is oblong, and neural six, lying for the most part between the sixth costals, is shield-shaped, coming to a point behind. The seventh costals are suturally united at their inner ends, where they develop a breadth sufficient to separate the eighth costals from each other. These latter are subtriangular in shape, with three convex sides. The nuchal plate was evidently small, as the lateral termination of the suture (*a* in the figure) between it and the left first costal indicates a side extension scarcely past a point in advance of the mid-length of the first costal. Small, shallow, rounded depressions mark the surface of the neurals and the inner ends of the costals. In the latter, as the distance from the neurals increases, the depressions gradually grow larger and more decided, becoming often reniform or oval, and frequently coalescing, until in the distal ends of the costals a few more or less continuous furrows are formed parallel with the outer margins of the plates. These furrows are a conspicuous feature in the sculpture; they are not so well marked on the posterior margin of the carapace, but they are well developed near the front edges of the first costals. In the neurals and inner halves of the costals there is a narrow, smooth strip devoid of sculpture bordering the sutures. The rib-heads are well developed.

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*Since the above was written some misplaced fragments have been added to the anterior end of this carapace; they reveal the fact that the first costals are in reality separated by a divided first neural. The writer wishes here to express his indebtedness to Professor Osborn and Dr. Hay, of the American Museum of Natural History, for the loan of the type of *Trionyx vagans* and the opportunity thus afforded him of making a direct comparison of the type with the Red Deer specimen.

Measurements:

	M.
Estimated length of carapace along median line (6½ inches)	·170
Distance from front margin of first costal to back margin of seventh costal (slightly over 6½ inches)	·167
Maximum breadth of carapace (8¼ inches)	·214
Length of second neural	·023
Maximum breadth of second neural	·017
Thickness of fourth costal at centre near inner end	·005
Thickness of fourth costal at centre near outer end	·005
Thickness of eighth costal at centre	·005

Trionyx planus,* Owen and Bell, a British Lower Eocene species, described from the posterior half of the carapace, bears a strong general resemblance to *T. foveatus* as regards the sculpture and also in the absence in both species of the seventh and eighth neurals accompanied by a similar curtailment of the sixth neural. The strong development of the seventh costals found in the Red Deer river carapace resulting in a reduction of the eighth pair of costals may be an irregularity of growth of no specific importance.

The second species of *Trionyx* represented by an almost complete carapace is referred to *T. vagans*, Cope, first described by that authority in 1874† from 'a number of fragments of costal bones and perhaps of sternals also,' from the 'Lignite cretaceous of Colorado: near the mouth of the Big Horn river, Montana: Long lake, Nebraska: found at the last two localities by Dr. Hayden.' Later, in 1875, in 'The Vertebrata of the Cretaceous Formations of the West' the same description appears: this time with figures of two fragments of costal bones. Dr. O. P. Hay, of the American Museum of Natural History, New York, has kindly compared part of a costal plate from the Red Deer river with fragments labelled *T. vagans* by Professor Cope in the New York collections. Owing to the insufficiency of the published description and figures of this species, the writer could scarcely judge whether the Canadian specimens were or were not referable to *T. vagans*, but Dr. Hay writes that he thinks they probably are.

The carapace (Plate IV, fig. 4) is broader than long, the breadth exceeding the length by more than one-sixth and it is only moderately convex. In outline, as seen from above, it is flat behind with the sides

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* Monograph of the British Reptilia of the London Clay, part I., p. 58, tab. XIXC, 849. Palæontographical Society.

† Bulletin of the United States Geological Survey of the Territories, 1874, No. 2, p. 27.

curving broadly to the front margin, at the centre of which there is a shallow concavity. The shell protrudes where the ribs pass outward from beneath, causing the lateral margin to be sinuous, the sinuosity being most marked toward the front in the first, second and third pairs of costal plates. Of the eight pairs of costals, the first costals are the broadest at the inner ends, whilst the fifth are the broadest distally. The seventh costals are extremely narrow throughout their length and the eighth pair is well developed. The first costals increase in breadth rather suddenly at their outer ends and are separated by a divided first neural plate. The neurals gradually decrease in breadth to the fifth, their sides being not so nearly parallel to each other as those of the corresponding plates in *T. ovatus*. The sixth and last neural is very much reduced in size and is irregularly oval in outline. Of the protruding rib-ends, all the six of the left side were secured, in a fair state of preservation, except the one belonging to the first costal and it was obtained in part. The rib heads are well developed. In the figure, the nuchal plate is represented as entire. Of the carapace under consideration, the central part only of the nuchal plate, extending from the margin in front to the suture behind, was found, but fortunately the left end of a nuchal, of another individual of similar size, showing the left front margin and the suture between the plate and the first costal with part of the latter adherent, supplied the deficiency. The sculpture consists of a network of narrow ridges ramifying and inosculating so as to enclose small, sunken areæ of irregular shape and size, the areæ being generally wider than the ridges are broad. The frequent confluence of a varying number of areæ results in a more open pattern, the ridges at times shewing a tendency to run in parallel lines. The sculpture is not so distinctly defined near the sides of the carapace as it is toward and at the centre and anteriorly, but in the hinder part it is more decidedly rugose, the ridges being here higher and the enclosed areæ larger. Near the intercostal sutures, more particularly in the inner halves of the costal bones, the sculpture is partially effaced and consists of low, poorly defined parallel ridges at right angles to the sutures, forming a distinct border, with a maximum breadth of about ·5 centimeters. A smooth border, broadest at the sides of the carapace and narrowest in front, extends along the whole of the peripheral edge.

As regards a divided first neural in species of this genus, it is interesting to note that Lydekker in describing *T. melitensis*, from the Miocene of Malta, in 1891, (Quarterly Journal of the Geological Society, vol. XLVII, p. 37, fig. 1) mentions the occurrence in the Miocene species of a divided first neural and remarks (p. 37) that 'all the fossil species

hitherto described, of which the entire carapace is known, agree with the normal type in having but a single long neural between the first pair of costals.'

Measurements :

	M.
Length of carapace along median line (18½ inches)	470
Maximum breadth of carapace (23½ inches)	590
Breadth of first costal at inner end	075
Thickness of same near inner end	009
Thickness of same at outer end	012
Breadth of fifth costal at outer end	119
Thickness of same at outer end	013
Breadth at mid length of seventh costal	036
Thickness at centre of eighth costal	010
Maximum breadth of neural I.	056
Maximum breadth of neural Ia	039
Length of same	043
Thickness of nuchal plate at left end	018
Length of vertebral centrum	045

EXPLANATION OF PLATES.

PLATE I.

FIGURE 1. Upper surface of the carapace of *Trionyx foveatus*, Leidy; from the Cretaceous of Alberta. One-half natural size. The sinuous lines indicate the sutures between the bones; the dotted ones parts restored; NU, nuchal bone; N 1, 2, &c., neural bones; C 1, 2, &c., costal bones.

FIGURE 1*a*. Outline of the transverse curve of the upper surface of the carapace.

PLATE II.

FIGURE 2. Upper surface of the carapace shewn in plate I; from a photograph. Considerably over one-half the natural size.

PLATE III.

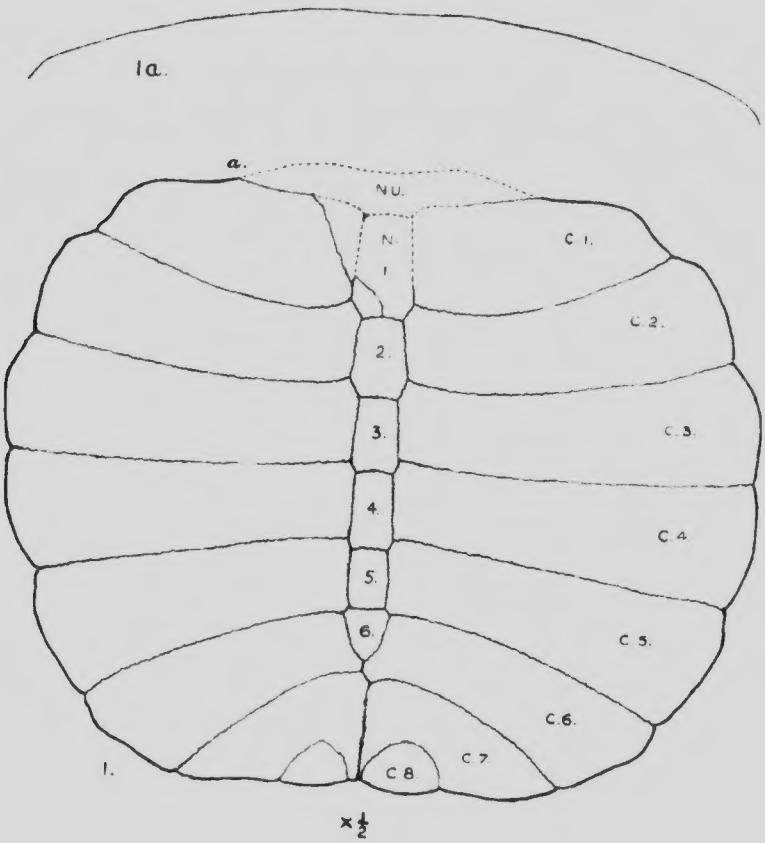
FIGURE 3. Upper surface of the carapace of *Trionyx vagans*, Cope; from the Cretaceous of Alberta. One eighth the natural size. Lines and letters as in figure 1 of plate I.

FIGURE 3*a*. Outline of the transverse curve of the upper surface of the carapace.

FIGURE 3*b*. The sculpture of part of the upper surface of the same carapace; from a photograph. Natural size.

PLATE IV.

FIGURE 4. Upper surface of the carapace shewn in plate III; from a photograph. Slightly less than one-fourth natural size.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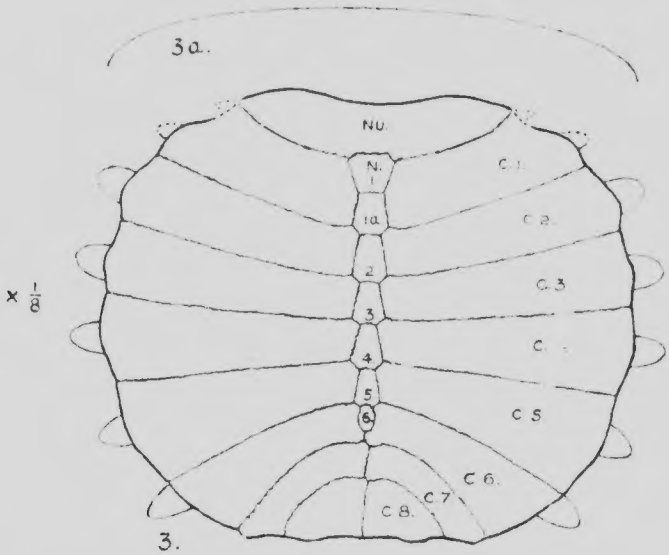

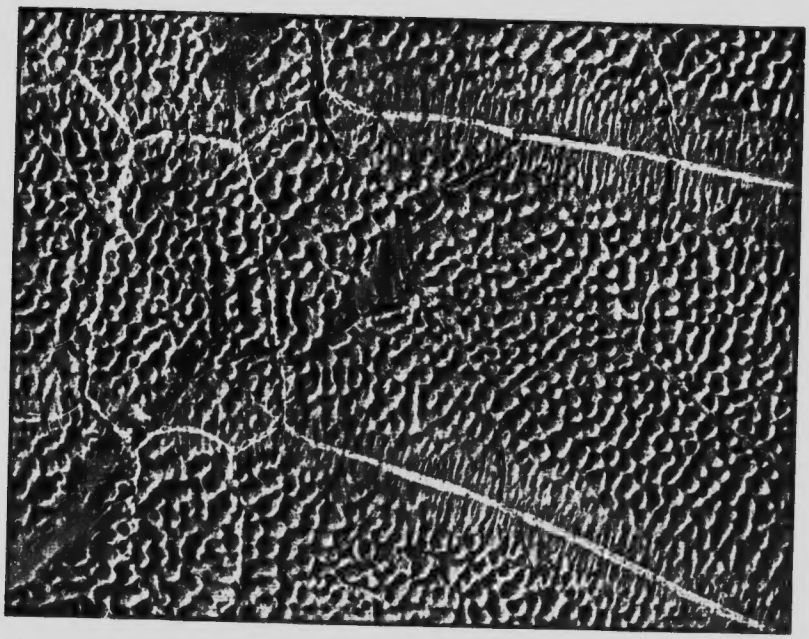
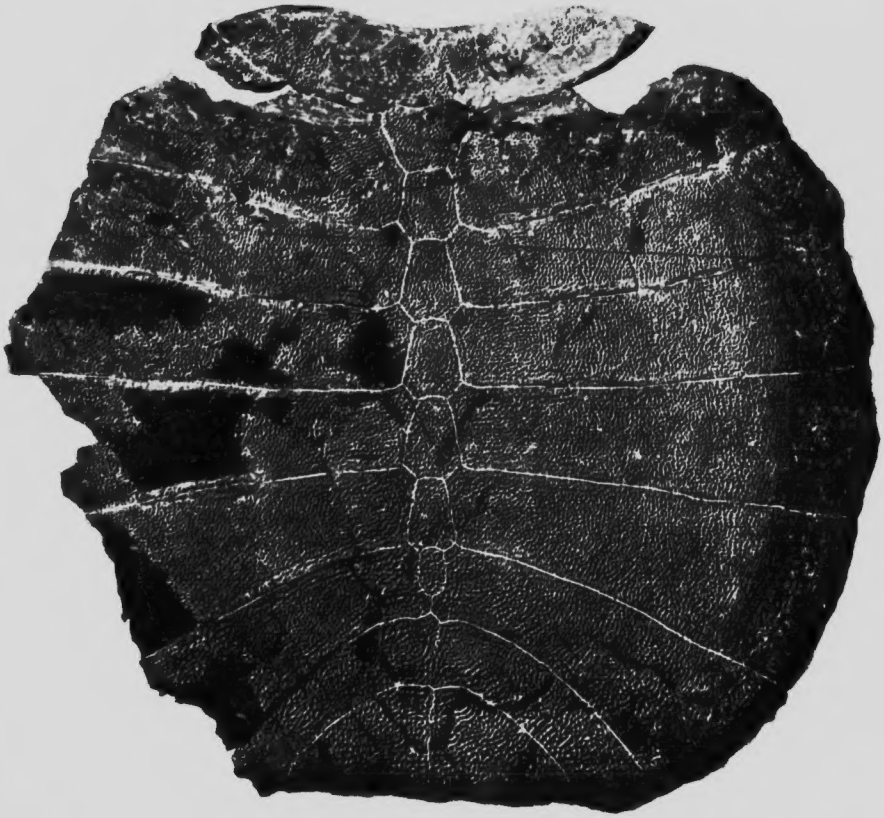
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